

$$\log_b n = p \rightarrow b^p = n$$

logarithm exponent

Solve the following equations and inequalities for x. ~~calculator~~

1) $14^x = 753$

$$\log_{14} 753 = x$$

$$\frac{\log 753}{\log 14} = x$$

$$x = 2.51$$

2) $7 + x^5 = 84$

$$\sqrt[5]{x^5} = \sqrt[5]{77}$$

$$x = 2.38$$

3) $\frac{3(8)^{x-3}}{3} = \frac{99}{3}$

$$8^{x-3} = 33$$

$$x-3 = \log_8 33 \rightarrow \frac{\log 33}{\log 8}$$

$$x = 1.68 + 3 = 4.68$$

4) $x = \log_5 71$

$$x = \frac{\log 71}{\log 5}$$

$$x = 2.65$$

5) $\log_5 (.04) = x$

$$\frac{\log .04}{\log 5} = x$$

$$x = -2$$

6) $\log_7 (2x-5) = 2$

$$7^2 = 2x-5$$

$$49+5 = 2x$$

$$\frac{54}{2} = \frac{2x}{2}$$

$$x = 27$$

7) $\log_7 83.5 = x$

$$\frac{\log 83.5}{\log 7} = x$$

$$x = 2.27$$

8) $\log_x 83 = 5$

$$\sqrt[5]{x^5} = \sqrt[5]{83}$$

$$x = 2.42$$

9) $5 = \log_3 (2x)$

$$3^5 = 2x$$

$$\frac{243}{2} = \frac{2x}{2}$$

$$121.5 = x$$

Write as a single logarithm.

10) $\log_4 7 + 5\log_4 x - \log_4 (10y)$

$$\log_4 (7x^5) - \log_4 (10y)$$

$$\log_4 \left(\frac{7x^5}{10y} \right)$$

11) $2\log_3 5 + 7\log_3 a$

$$\log_3 (25) + \log_3 a^7$$

$$\log_3 (25a^7)$$

12) $7\log_a X - 5\log_a W$

$$\log_a \left(\frac{X^7}{W^5} \right)$$

Simplify

13) $\frac{x^2}{5x^2-14x-3} \cdot \frac{2(5x+1)}{6x}$

$$(5x+1)(x-3)^3$$

$$\frac{x}{3(x-3)}$$

14) $\frac{5x-1}{x^2+10x+21} + \frac{8 \cdot (x+3)}{(x+7) \cdot (x+3)}$

$$\frac{5x-1+8x+24}{(x+7)(x+3)}$$

$$\frac{13x+23}{x^2+10x+21}$$

15) $\frac{x^2+8}{x+5} + \frac{7x+2}{x+5}$

$$\frac{x^2+7x+10}{(x+5)}$$

$$\frac{(x+5)(x+2)}{(x+5)} = x+2$$

Solve each equation.

$$16) \frac{3}{3} \left(\frac{4x}{5} - \frac{(x-2)}{3} \right) = x$$

$$① \frac{12x}{15} - \frac{5x-10}{15} = x$$

$$② \frac{12x-5x+10}{15} = x \quad ③ \frac{7x+10}{15} = \frac{x}{1}$$

$$④ 7x+10 = 15x \quad ⑤ 5x+35 = 36$$

$$⑥ \frac{10}{8} = \frac{8x}{8} \quad ⑦ 5x = 36-35$$

$$⑧ x = \frac{5}{4} = 1.25$$

$$17) \frac{5}{3} - \frac{8}{x+7} = \frac{4}{x+7}$$

$$① \frac{5}{3} = \frac{4}{x+7} + \frac{8}{x+7}$$

$$② \frac{5}{3} = \frac{12}{x+7}$$

$$③ 5(x+7) = 3(12)$$

$$④ 5x+35 = 36$$

$$⑤ 5x = 36-35$$

$$5x = 1$$

$$18) \frac{6}{x} = \frac{x-3}{3}$$

$$18 = x(x-3)$$

$$18 = x^2 - 3x$$

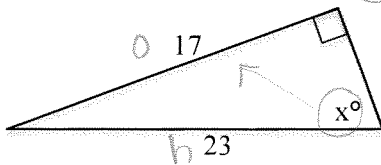
$$0 = x^2 - 3x - 18$$

$$0 = (x-6)(x+3)$$

$$x = 6 \text{ and } x = -3$$

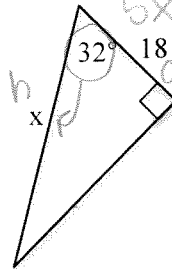
Trigonometry. Find x.

19)



$$\sin(x) = \frac{17}{23}$$

$$\sin(x) = .739 \quad x = 47.65^\circ$$



$$\cos(32) = \frac{18}{x}$$

$$.848(x) = 18$$

$$x = \frac{18}{\cos(32)}$$

$$x = 21.22$$

Applications.

The population of Marshall County in n years can be predicted by using the equation: $P = 48,000(1.02)^x$.

21) What will the population be in 5 years?

$$48,000(1.02)^5$$

$$52,996 \text{ people}$$

22) How long will it take for the population of Marshall County to reach 60,000?

$$60,000 = 48,000(1.02)^x$$

$$\frac{60,000}{48,000} = (1.02)^x$$

$$1.25 = 1.02^x$$

$$\frac{\log(1.25)}{\log(1.02)} = x$$

$$11.27 \text{ years}$$

23) A new television costs \$1,200.00. It will decrease in value 1% per month. Show work.

a) What will it be worth in 8 months?

$$1200(.99)^8$$

$$b = 1 - .01 = .99$$

$$\$1107$$

b) How much longer will it be until the TV is worth \$750.00?

(round your answer to 2 decimal places)

$$46.76 - 8 = 38.76 \text{ months}$$

$$750 = 1200(.99)^x$$

$$\frac{750}{1200} = .99^x$$

$$.625 = .99^x$$

$$\frac{\log .625}{\log .99} = x$$

$$x = 46.76$$